Revised 5/5/2021

LONGMAN'S BEAKED WHALE (*Indopacetus pacificus*): Hawaii Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

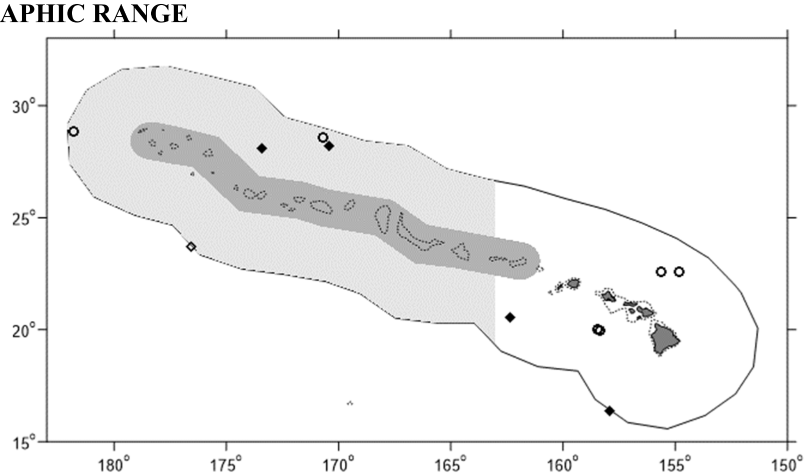

Figure 1. Sighting locations of Longman's beaked whale during the 2002 (diamond), 2010 (circle), and 2017 (square) shipboard cetacean surveys of U.S. waters surrounding the Hawaiian Islands (Barlow 2006, Bradford *et al.* 2017, Yano *et al.* 2018). Outer line indicates approximate boundary of survey area and U.S. EEZ. Dark gray shading indicates the original Papahanaumokuakea Marine National Monument, with the lighter gray shading denoting the full 2016 Expansion area. Dotted line represents the 1000 m isobath.

Longman's beaked whale is considered one of the least known cetacean species (Jefferson *et al.* 1993; Rice 1998; Dalebout *et al.* 2003), originally known only from two skulls found in Australia and Somalia (Longman 1926; Azzaroli 1968). Genetic studies (Dalebout *et al.* 2003) have revealed that sightings of 'tropical bottlenose whales' (*Hyperoodon* sp.; Pitman *et al.* 1999) in the Indo-Pacific region were in fact Longman's beaked whales, providing the first description of the external appearance of this species. Although originally described as *Mesoplodon pacificus* (Longman 1926), it has been proposed that this species is sufficiently unique to be placed within its own genus, *Indopacetus* (Moore 1968; Dalebout *et al.* 2003). The distribution of Longman's beaked whale, as determined from stranded specimens and sighting records of 'tropical bottlenose whales', includes tropical waters from the eastern Pacific westward through the Indian Ocean to the eastern coast of Africa. A single stranding of Longman's beaked whale has been reported in Hawaii, in 2010 near Hana, Maui (West *et al.* 2012), and there was a single sighting off Kona over 13 years of nearshore surveys off in the leeward waters of the main Hawaiian Islands (Baird 2016). Summer/fall shipboard surveys of the waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands, resulted in one sighting in 2002, three in 2010, and seven in 2017 (Barlow 2006, Bradford *et al.* 2017, Yano *et al.* 2018; Figure 1).

For the Marine Mammal Protection Act (MMPA) stock assessment reports, there is one Pacific stock of Longman's beaked whales, found within waters of the Hawaiian Islands EEZ. This stock includes animals found both within the Hawaiian Islands EEZ and in adjacent high seas waters; however, because data on abundance, distribution, and human-caused impacts are largely lacking for high seas waters, the status of this stock is evaluated based on data from U.S. EEZ waters of the Hawaiian Islands (NMFS 2005).

POPULATION SIZE

Encounter data from shipboard line-transect surveys of the entire Hawaiian Islands EEZ were recently reevaluated for each survey year, resulting in the following abundance estimates of Longman's beaked whales in the Hawaii EEZ (Bradford *et al.* 2021; Table 1).

Table 1. Line-transect abundance estimates for Longman's beaked whale derived from surveys of the entire Hawaii EEZ in 2002, 2010, and 2017 (Bradford *et al*. 2021).

Year	Abundance	CV	95% Confidence Limits
2017	2,550	0.67	771-8,432
2010	7,003	0.63	2,260-21,697
2002	871	1.06	158-4,798

The updated design-based abundance estimates use sighting data from throughout the central Pacific to estimate the detection function and use Beaufort sea-state-specific trackline detection probabilities for Longman's beaked whales from Barlow *et al.* (2015). Although previous estimates from the Hawaii EEZ have been published using subsets of this data, Bradford *et al.* (2021)*,* uses a consistent approach for estimating all abundance parameters and are considered the best available estimates for each survey year. The best estimate of abundance is based on the 2017 survey, or 2,550 (CV=0.67) whales.

Minimum Population Estimate

The minimum population size is calculated as the lower 20th percentile of the log-normal distribution (Barlow *et al.* 1995) around the 2017 abundance estimate, or 1,527 Longman's beaked whales within the Hawaiian Islands EEZ.

Current Population Trend

The three available abundance estimates for this stock have very broad and overlapping confidence intervals, precluding robust evaluation of population trend for this stock.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

No data are available on current or maximum net productivity rate for Longman's beaked whales.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for this stock is calculated as the minimum population size within the U.S. EEZ of the Hawaiian Islands (1,527) times one half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of 0.50 (for a stock of unknown status with no known fishery mortality or serious injury within the Hawaiian Islands EEZ; Wade and Angliss 1997), resulting in a PBR of 15 Longman's beaked whales per year.

HUMAN CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Information on fishery-related mortality and serious injury of cetaceans in Hawaiian waters is limited, but the gear types used in Hawaiian fisheries are responsible for marine mammal mortality and serious injury in other U.S. fisheries. No interactions between nearshore fisheries and Longman's beaked whales have been reported in Hawaiian waters. No estimates of human-caused mortality or serious injury are currently available for nearshore hook and line fisheries because these fisheries are not observed or monitored for protected species bycatch. There are currently two distinct longline fisheries based in Hawaii: a deep-set longline (DSLL) fishery that targets primarily tunas, and a shallow-set longline fishery (SSLL) that targets swordfish. Both fisheries operate in U.S. waters and on the high seas. Between 2014 and 2018, no Longman's beaked whales were observed hooked or entangled in the SSLL fishery (100% observer coverage) or the DSLL fishery (20-22% observer coverage) (Bradford 2018a, 2018b, 2020*,* Bradford and Forney 2017, McCracken 2019).

Other Mortality

Anthropogenic sound sources, such as military sonar and seismic testing have been implicated in the mass strandings of beaked whales, including atypical events involving multiple beaked whale species (Simmonds and Lopez-Jurado 1991, Frantiz 1998, Anon. 2001, Jepson *et al.* 2003, Cox *et al.* 2006). While D'Amico *et al.* (2009) note that most mass strandings of beaked whales are unassociated with documented sonar activities, lethal or sub-lethal effects of such activities would rarely be documented, due to their remote nature and the low probability that an injured or dead beaked whale would strand. Filadelpho *et al.* (2009) reported statistically significant correlations between military sonar use and mass strandings of beaked whales in the Mediterranean and Caribbean Seas, but not in Japanese and Southern California waters, and hypothesized that regions with steep bathymetry adjacent to coastlines are more conducive to stranding events in the presence of sonar use. Similarly, Simonis *et al.* (2020) reported a statistically significant correlation between sonar use and single and mass stranding events of beaked whales in the Mariana Archipelago. In Hawaiian waters, Faerber and Baird (2010) suggest that the probability of stranding is lower than in some other regions due to nearshore currents carrying animals away from beaches, and that stranded animals are less likely to be detected due to low human population density near many of Hawaii's beaches. Actual and simulated sonar are known to interrupt foraging dives and echolocation activities of tagged beaked whales (Tyack *et al*. 2011, DeRuiter *et al*. 2013). Cuvier's beaked whales tagged and tracked during simulated mid-frequency sonar exposure showed avoidance reactions, including prolonged diving, cessation of foraging echolocation click production, and directional travel away from the simulated sonar source (DeRuiter *et al*. 2013). Blainville's beaked whale presence was monitored on hydrophone arrays before, during, and after sonar activities on a Caribbean military range, with evidence of avoidance behavior: whales were detected throughout the range prior to sonar exposure, not detected in the center of the range coincident with highest sonar use, and gradually returned to the range center after the cessation of sonar activity (Tyack *et al*. 2011). Fernández *et al*. (2013) report that there have been no mass strandings of beaked whales in the Canary Islands following a 2004 ban on sonar activities in that region. The absence of beaked whale bycatch in California drift gillnets following the introduction of acoustic pingers into the fishery implies additional sensitivity of beaked whales to anthropogenic sound (Carretta *et al*. 2008, Carretta and Barlow 2011). No estimates of potential mortality or serious injury are available for U.S. waters.

STATUS OF STOCK

The Hawaii stock of Longman's beaked whales is not considered strategic under the 1994 amendments to the MMPA. The status of Longman's beaked whales in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. Longmans' beaked whales are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor designated as "depleted" under the MMPA. Given the absence of recent recorded fishery-related mortality or serious injuries, the total fishery mortality and serious injury can be considered to be insignificant and approaching zero. The impacts of anthropogenic sound on beaked whales remain a concern (Barlow and Gisiner 2006, Cox *et al*. 2006, Hildebrand *et al*. 2005, Weilgart 2007). The first confirmed case of *morbillivirus* in a Hawaiian cetacean was found in a subadult Longman's beaked whale stranded on Maui in 2010 (West *et al*. 2012). The presence of *morbillivirus* in all 3 known species of beaked whales in Hawaiian waters (Jacob *et al*. 2016), raises concerns about the history and prevalence of this disease in Hawaii and the potential population impacts, including cumulative impacts of disease with other stressors.

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